

Lesson 7

Special Analytical Issues



Objectives for Lesson 7

- Describe nature of public health surveillance data
- Define nomenclature for variations in health events
- Demonstrate correct use of analytical and graphical methods to correct for aberrations in time
- Demonstrate correct assessment of surveillance system completeness
- Select appropriate analytic methods
- Describe emergent analytic methods in analysis of surveillance data



Characteristics of Surveillance Data

- Data are reported regularly and may be updated
- Data are generated by spatial and temporal processes
- Cannot assess case distribution if only aggregated data are available
- Surveillance process is generally a multivariate one



Variations in Health Events: Terminology

Cluster: a group of events occurring usually close together to each other in time, space, or demographic group

Epidemic: the occurrence in a community or region of cases of an illness, specific health-related behavior, or other health-related event in excess of normal expectancy

Aberration: changes in the occurrence of health events that are statistically significant when compared with usual or normal history

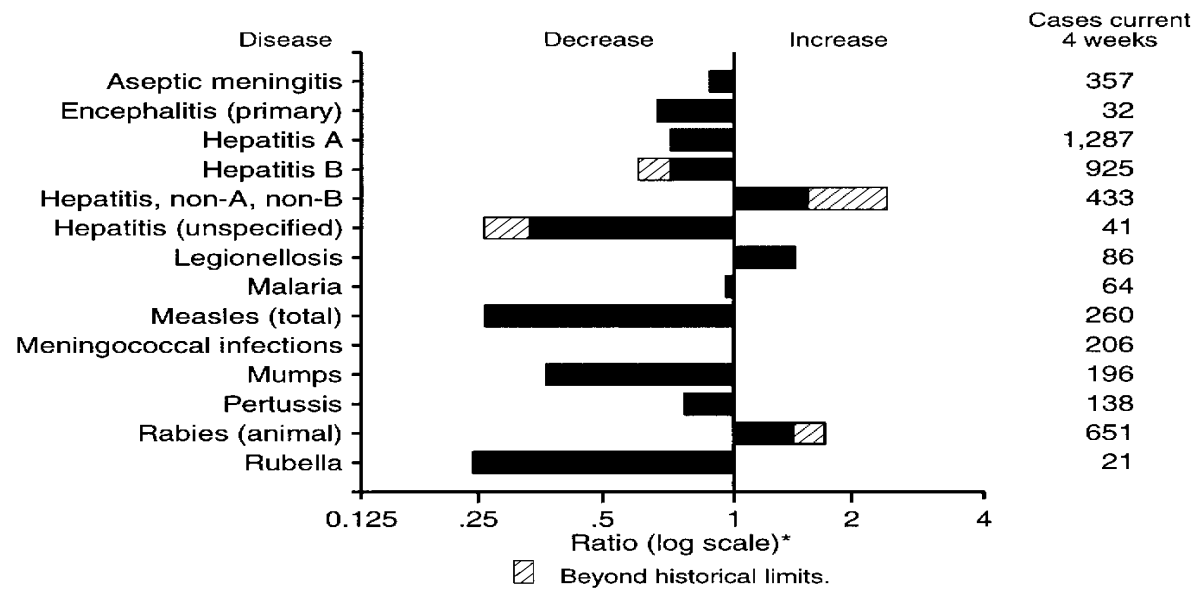


Aberrations in Time

- Questions to Ask
- Current/Past Experience Graph (CPEG)
- Time-series Model
- Scan Statistic

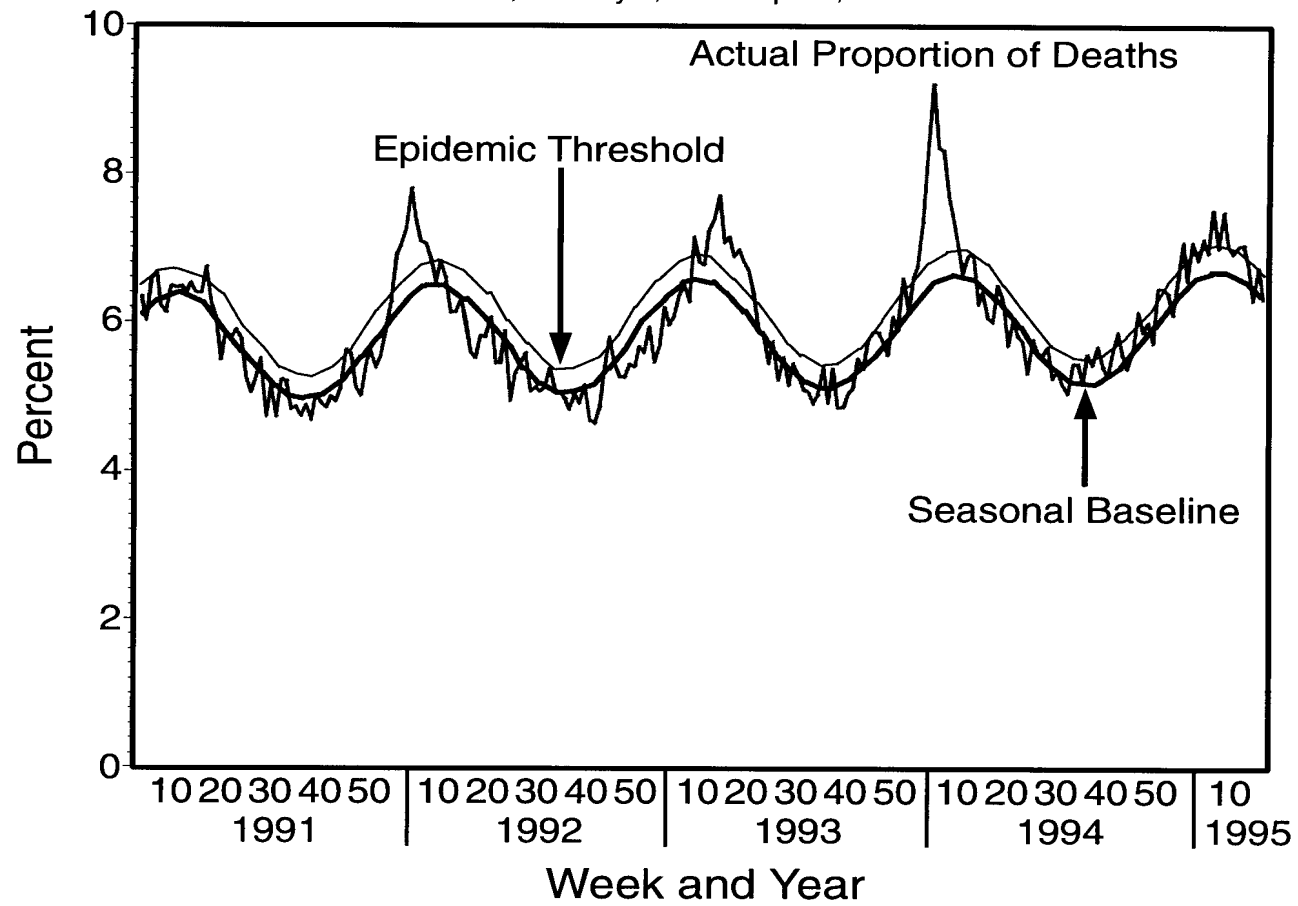


Deviation bar chart of notifiable-disease reports, comparison of 4-week totals ending May 23, 1992, with historical data --- United States



Notes * Ratio of current 4-week total to the mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

Weekly pneumonia and influenza mortality as a percentage of all deaths
for 121 cities --- United States, January 1, 1991--April 8, 1995



Surveillance data are reported over a time period T , containing intervals of equal length:



where $t_i, i = 1, 2, \dots, k$ are of equal length t
 and $T = t_1 + t_2 + \dots + t_k$



Approaches to Assessment of Completeness

- U.S. Census Bureau's method
- Chandra Sekar-Demming method
- Lincoln-Peterson Capture-Recapture method



Chandra Sekar-Deming Capture - Recapture Method

Surveillance System 1

<i>Surveillance System 2</i>	<i>Cases Reported</i>	<i>Cases Not Reported</i>	<i>All Cases</i>
Cases reported	C	N_2	S
Cases not reported	N_1	X	
All cases	R		N

$$N = [(R + 1) (S + 1) / (C + 1)] - 1$$



Framework for Selecting an Analytic Method (part 1)

- What is the purpose of the surveillance system?
- What is the purpose of the analytic methods?
- Which conditions should be monitored
- What is the (time, place, or person) unit of analysis?
- What provision is there for updating or correcting the data using later reports?



Framework for Selecting an Analytic Method (part 2)

- How is the baseline determined?
- How are outbreaks in the baseline handled?
- What are the sensitivity and predictive value positive of the method?
- What are the mechanics of operation?



New developments in technology and analytic methods offer valuable opportunities for surveillance practice:

- including information beyond the data (expert knowledge)
- increasing the stability of observed rates from areas with small populations

